Amendments to the Claims:

Please cancel claims 5-11 as follows. Please amend claims 1, 12, 14, and 18 as follows. Please add new claims 21-41 as follows.

This listing of claims replaces all prior versions, and listings, of claims in the application.

Listing of claims:

1. (currently amended) A method of manufacturing a capacitor, the method comprising:

forming a lower metal electrode of a capacitor;

performing a primary wet treatment on [[the]]a surface of the lower metal electrode to remove unwanted surface oxides from the surface of the lower metal electrode;

performing a secondary wet treatment on the surface of the lower metal electrode by using a different etchant than an etchant used in the primary wet treatment to remove unwanted surface organic materials from the surface of the lower metal electrode, wherein the secondary wet treatment is performed using an etchant containing ozone water;

forming a dielectric layer on the lower metal electrode using a high-k dielectric material; and

forming an upper metal electrode on the dielectric layer.

2. (original) The method of claim 1, wherein the lower metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof, and wherein the upper metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof.

3. (original) The method of claim 1, wherein the lower metal electrode and the upper metal electrode are formed of titanium nitride.

4. (original) The method of claim 1, wherein the primary wet treatment is performed using an etchant containing one selected from the group consisting of HF, LAL, and SC1, or a combination thereof.

5. - 11. (canceled)

12. (currently amended) A method of manufacturing a capacitor, the method comprising:

forming a lower metal electrode of a capacitor;

performing a primary wet treatment on [[the]]a surface of the lower metal electrode;

performing a secondary wet treatment on the surface of the lower metal electrode using an etchant containing LAL;

performing a third wet treatment on the surface of the lower metal electrode using an etchant containing ozone water;

forming a dielectric layer on the surface of the lower metal electrode using a high-k dielectric material; and

forming an upper metal electrode on the dielectric layer.

13. (original) The method of claim 12, wherein the lower metal electrode and the upper metal electrode are formed of titanium nitride.

14. (currently amended) The method of claim 12, wherein the forming of the lower metal electrode comprises:

forming a molding layer;

forming a mold having a recess by patterning the molding layer;

forming a lower metal electrode layer having a recess along an inner surface of the recess of the mold;

forming a sacrificial layer to fill the recess of the lower metal electrode layer;

forming [[a]] the lower metal electrode by separating the lower metal electrode layer by

planarizing the sacrificial layer and the lower metal electrode layer until [[the]]a top surface of the mold layer is exposed; and

selectively removing [[the]]a remaining portion of the sacrificial layer.

15. (original) The method of claim 14, wherein the separation of the lower metal electrode layer comprises planarizing the lower metal electrode layer using chemical mechanical polishing.

16. (original) The method of claim 12, wherein the primary wet treatment is performed for about 1 minute to 10 minutes using as an etchant a HF diluted with deionized water in a ratio of 1: 200.

17. (original) The method of claim 12, wherein the secondary wet treatment is performed for about 5 seconds to 50 seconds.

18. (currently amended) A method of manufacturing a capacitor, the method comprising:

forming a lower metal electrode of a capacitor;

performing a primary wet treatment on the surface of the lower metal electrode using an etchant containing HF;

performing a secondary wet treatment on [[the]]a surface of the lower metal electrode using an etchant containing LAL;

performing a third wet treatment on the surface of the lower metal electrode using an etchant containing H_2SO_4;

forming a dielectric layer on the lower metal electrode using a high-k dielectric material; and

forming an upper metal electrode on the dielectric layer.

19. (original) The method of claim 18, wherein the lower metal electrode and the

upper metal electrode are formed of titanium nitride.

20. (original) The method of claim 18, wherein the third wet treatment is performed using the H_2SO_4-containing etchant further containing H_2O_2 at a temperature ranging from about 70 °C to 90 °C.

21. (new) A method of manufacturing a capacitor, the method comprising:

forming a lower metal electrode of a capacitor;

performing a primary wet treatment on a surface of the lower metal electrode to remove unwanted surface oxides from the surface of the lower metal electrode, wherein the primary wet treatment is performed using an etchant containing one selected from the group consisting of HF, LAL, and SC1, or a combination thereof;

performing a secondary wet treatment on the surface of the lower metal electrode by using a different etchant than an etchant used in the primary wet treatment to remove unwanted surface organic materials from the surface of the lower metal electrode, wherein the secondary wet treatment is performed using an etchant containing ozone water;

forming a dielectric layer on the lower metal electrode using a high-k dielectric material; and

forming an upper metal electrode on the dielectric layer.

22. (new) The method of claim 21, wherein the lower metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof, and wherein the upper metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof.

23. (new) The method of claim 21, wherein the lower metal electrode and the upper metal electrode are formed of titanium nitride.

24. (new) The method of claim 21, wherein the SC1 is used as an etchant at a temperature ranging from about 30 °C to 50 °C.

25. (new) A method of manufacturing a capacitor, the method comprising:

forming a lower metal electrode of a capacitor;

performing a primary wet treatment on a surface of the lower metal electrode to remove unwanted surface oxides from the surface of the lower metal electrode, wherein the primary wet treatment is performed using an etchant containing LAL;

subsequent to performing the primary wet treatment, performing a secondary wet treatment on the surface of the lower metal electrode by using a different etchant than an etchant used in the primary wet treatment to remove a remaining residue of unwanted surface oxides and unwanted surface organic materials from the surface of the lower metal electrode, wherein the secondary wet treatment is performed using an etchant containing H_2SO_4;

forming a dielectric layer on the lower metal electrode using a high-k dielectric material; and

forming an upper metal electrode on the dielectric layer.

26. (new) The method of claim 25, wherein the lower metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof, and wherein the upper metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof.

27. (new) The method of claim 25, wherein the lower metal electrode and the upper metal electrode are formed of titanium nitride.

28. (new) The method of claim 25, wherein the etchant containing H_2SO_4 used for the secondary wet treatment further contains H_2O_2.

29. (new) A method of manufacturing a capacitor, the method comprising:

forming a lower metal electrode of a capacitor;

performing a primary wet treatment on a surface of the lower metal electrode to remove unwanted surface oxides from the surface of the lower metal electrode, wherein the primary wet treatment is performed using an etchant containing SC1;

subsequent to performing the primary wet treatment, performing a secondary wet treatment on the surface of the lower metal electrode by using a different etchant than an etchant used in the primary wet treatment to remove a remaining residue of unwanted surface oxides and unwanted surface organic materials from the surface of the lower metal electrode, wherein the secondary wet treatment is performed using an etchant containing H_2SO_4;

forming a dielectric layer on the lower metal electrode using a high-k dielectric material; and

forming an upper metal electrode on the dielectric layer.

30. (new) The method of claim 29, wherein the lower metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof, and wherein the upper metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof.

31. (new) The method of claim 29, wherein the lower metal electrode and the upper metal electrode are formed of titanium nitride.

32. (new) The method of claim 29, wherein the etchant containing H_2SO_4 used for the secondary wet treatment further contains H_2O_2.

33. (new) The method of claim 29, wherein the SC1 is used as an etchant at a temperature ranging from about 30 °C to 50 °C.

34. (new) A method of manufacturing a capacitor, the method comprising:

forming a lower metal electrode of a capacitor;

performing a primary wet treatment on a surface of the lower metal electrode to remove unwanted surface oxides from the surface of the lower metal electrode, wherein the primary wet treatment is performed using an etchant containing one selected from the group consisting of HF, LAL, and SC1, or a combination thereof;

subsequent to performing the primary wet treatment, performing a secondary wet treatment on the surface of the lower metal electrode by using a different etchant than an etchant used in the primary wet treatment to remove a remaining residue of unwanted surface oxides and unwanted surface organic materials from the surface of the lower metal electrode, wherein the secondary wet treatment is performed using an etchant containing H_2SO_4;

forming a dielectric layer on the lower metal electrode using a high-k dielectric material; and

forming an upper metal electrode on the dielectric layer.

35. (new) The method of claim 34, wherein the lower metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof, and wherein the upper metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof.

36. (new) The method of claim 34, wherein the lower metal electrode and the upper metal electrode are formed of titanium nitride.

37. (new) The method of claim 34, wherein the etchant containing H_2SO_4 used for the secondary wet treatment further contains H_2O_2.

38. (new) A method of manufacturing a capacitor, the method comprising:

forming a lower metal electrode of a capacitor;

performing a primary wet treatment on a surface of the lower metal electrode to remove unwanted surface oxides from the surface of the lower metal electrode, wherein the primary wet treatment is performed using an etchant containing HF;

subsequent to performing the primary wet treatment, performing a secondary wet treatment on the surface of the lower metal electrode by using a different etchant than an etchant used in the primary wet treatment to remove a remaining residue of unwanted surface oxides and unwanted surface organic materials from the surface of the lower metal electrode, wherein the secondary wet treatment is performed using an etchant containing H_2SO_4;

forming a dielectric layer on the lower metal electrode using a high-k dielectric material; and

forming an upper metal electrode on the dielectric layer.

39. (new) The method of claim 38, wherein the lower metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof, and wherein the upper metal electrode is formed of one selected from the group consisting of titanium nitride, tantalum nitride, tungsten nitride, platinum, and ruthenium or a combination thereof.

40. (new) The method of claim 38, wherein the lower metal electrode and the upper metal electrode are formed of titanium nitride.

41. (new) The method of claim 38, wherein the etchant containing H_2SO_4 used for the secondary wet treatment further contains H_2O_2.